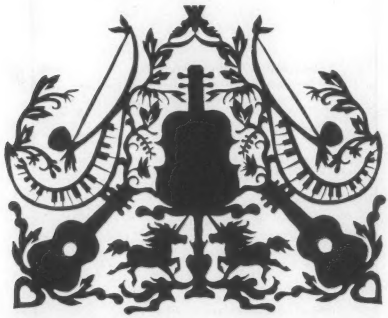
VOLUME II NUMBER 1 JUNE 1986 PRICE 3.50

EXPERIMENTAL MUSICAL INSTRUMENTS

FOR THE DESIGN, CONSTRUCTION AND ENJOYMENT OF NEW SOUND SOURCES



IN THIS ISSUE

With this issue, **Experimental Musical Instruments** enters its second year of publication. We thank all our readers for being with us and contributing so much this past year. With this kind of support, we're looking forward to the coming year with high hopes. Let's take the opportunity now to have a look at what EMI is doing, where we have been and where we are going.

EDITORIAL PURPOSES AND POLICY

Experimental Musical Instruments was founded on the idea that there is a need for a forum devoted to explorations into new musical sound sources. Producing the publication over the past year has convinced me that this premise is in fact more valid than I originally thought. There has indeed been a great groundswell of creative instrument design in recent years, and it continues to grow in size and importance. The need for a place to discuss who is doing what, in enough specific detail to create a useful and accurate picture of individual projects as well as general trends, is as great as ever.

Judging from the responses received from our growing community of readers and contributors, EMI seems thus far to be on the right track in its efforts to serve that purpose. Still, we continue to learn from people's responses, and, heaven knows, there is always room for improvement.

One editorial issue which has proven to be a bit sticky so far is the question of how much highly technical or specialized information should appear in these pages. EMI walks a thin line on this point; or perhaps I should say, it meanders about on both sides of a thin line. One of the primary purposes of the newsletter is to present the nitty gritty nuts-and-bolts information on how the instruments under discussion work and are put together; what the acoustic principles are and how

****

Above left: Cover art from one of Robin Goodfellow's instrument books for children -- see page 10.

(continued on page 18)

LETTERS

Got your issue no. 6 yesterday and was very glad to see that you took up the subject of names for instruments. You are quite right! The name can make or break the future of that instrument. Some names are too hard to remember -- I have heard the Theremin called the **thermal** a number of times, implying it was for playing hot music. Weirdest consequence I suppose was when the Bazooka, a sort of bass kazoo, became the standard name for a war weapon and its musical-instrument meaning is totally forgotten.

I haven't had too much trouble with **Megalyra** -- you might like to know how it came to be so-called: An affair using a huge metal girder called the Cosmic Beam was on display in Hollywood about the time I built the first Megalyra and Erv Wilson took me over to hear it. So he thought I should call mine the Cosmic Lyre. Well I thanked him politely, but in the cold grey light of the next dawn I had misgivings: too much like the other name for one thing, and for another people would hear it and write it down as the **Cosmic Liar** -- especially when I would have to tell them it was played with a big steel, which they would hear as "big Steal." Ouch!

I gave it ooooodles of thought for a while. I could call some instruments **Kosmolyra** -- this being international because it follows Greek very closely -- so it would be the same in dozens of languages. Then call the big contrabasses **Megalyra** since mega means **big.** The **Hobnailed Newel Post** name followed from building the instrument and presto! that's what it looked like. No problem at all. There are four of them so far.

It's now about eight years that I have been seeking a better name for the **Drone Instrument** since drone means "lazy" or "shiftless" to many people. Even though droning on a bass note is its principle function. I am welcoming suggestions. No hurry. In 1940 I built an 8-foot-long metal-frame, no soundingboard **Amplifying Clavichord.** The many moves since then wrecked it. Nowhere to put it in the last five homes. The name may have spoilt its future -- nobody -- nobody at all -- knew what a **clavichord** was. Like the proverbial albatross around its neck. It sounded wonderful and I have a few tapes from 1956 and 1964 or so. Maybe if I had had a better name I would have gotten financial backing and moral support. After reading your article, I have a clue: The names you cite as being favorable make people think in **pictures.** Take my own first, everybody has seen hobnailed boots and other things called hobnailed, and most people have gone up or down stairways that have one or two Newel Posts. Look at the tuning pins and hitch pins on that instrument and they sure look like hobnails.

Spoils of War calls up all kinds of movies and TV shows and adventure stories. Beepmobile (it's right here in San Diego and I have seen it many times and tooted its horns) calls up plenty of pictures in the average person's mind. The Bell Garden was laid out in a real big garden and it jangles in the wind. Both bells and gardens immediately call up mental pictures. Some people call the ocarina a sweet potato -- again, familiar picture. **Musical saw** isn't too bad -- everybody knows what a saw looks like.

Somewhere in my files here is a magazine article clipping about a firm in San Francisco that does nothing but think up new names for products -- at several thousand dollars per each!

Before I leave the subject, I might mention some names that my **typewriter** has invented once in a while. Piano sometimes comes out **paino,** but more often **pinao.** I'm quite sure you have heard both of those new instruments. Another is the **hrapsichord.** And then there's the real snappy **bnajo.** And does anybody play footnotes on a shoehorn?

In the article about Susan Rawcliffe I see one instrument very close to the one she presented to me several years ago -- it looks like a Mexican

EXPERIMENTAL MUSICAL INSTRUMENTS
A Newsletter for the Design, Construction and Enjoyment of New Sound Sources

ISSN 0883-0754

Editor
Bart Hopkin

Editorial Board
Prof. Donald Hall
Roger Hoffmann
Jonathan Glasier
Jon Scoville

Published in February, April, June, August, September and December by Experimental Musical Instruments
P.O. Box 784
Nicasio, CA 94946
(415) 662-2182

Subscriptions $20/year.
Back issues $3.50 apiece.

ADVERTISING POLICY: Experimental Musical Instruments is set up to survive on subscriptions rather than advertising, but we will run ads which are potentially interesting or valuable to the readership. Please write for advertising rates.
Subscribers can place relevant classified ads of up to 40 words without charge, and they will receive a 15% discount on display ads.

SUBMISSIONS: We welcome submissions of articles relating to new instruments. Articles about one's own work are especially appropriate. A query letter or phone call are suggested before sending articles. Include a return envelope with submissions.

idol but plays the Japanese scale. Marlin Halverson in San Bernardino makes instruments that sound something like hers but his are decorative cross-grained wood. I have a small one here.

As you've already gleaned from my annual report, my nomination for worst musical instrument name is **synthesizer**. This was a horrid mistake and set it back for twenty years at least -- since it got the musicians' unions raging flaming hopping mad. I wish the name's inventors hadn't waved red flags in from of bulls. Fortunately we are beginning to call them **keyboards** and that may help.

Thanks again for reminding me of the importance of names and then I won't make new mistakes like that one.

Ivor Darreg

Bonus: Most of what you wrote applies equally to names for musical **compositions**.

****

I've got some additional thoughts on your article about instrument names and naming. There seems to be a greater-than-normal amount of possibility for puns, reversals and general arcane tomfoolery in the naming of instruments, perhaps because both elements in the process (instruments and words) are so intimately related to the nature of sound.

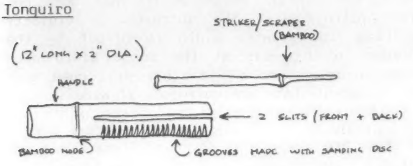
My friend Cleve Pozar, a percussionist, told me about a neat little tool you can make -- I call it a Universal Excitation Device. It's simply a teriaki skewer/superball beater. The Device requires a very light touch: you drag it along glass or metal and it unearths some amazing vibrational effects. Cleve's friend's specialty was vibrating big old Coca Cola signs (on the sides of buildings!) If you rub the UED around the inside of a large salad bowl, you can play a piece I like to call "Tibetan Salad Bowls." Vibrating a suspended sheet of aluminum barn roofing results in the "Lunenburg Wail Raiser." And so it goes.

Tony Pizzo

****

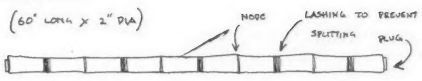
I've enjoyed your publication immensely. In regard to bamboo instruments, here are two that I've made and used extensively:

Tonquiro



MAY BE SCRAPED LIKE A CONVENTIONAL GUIRO OR STRUCK ON TONGUE AREAS OR HANDLE AREA TO PRODUCE VARYING SOUNDS

Devil Stick



BAMBOO SEGMENT WITH NODES OPENED BY A RED HOT STEEL POKER, FILLED WITH SMALL PEBBLES (OR BALL BEARINGS) AND PLUGGED AT ENDS.

MAY BE SHAKEN OR TWIRLED OR ROLLED BETWEEN PALMS TO PRODUCE A VERY POWERFUL SHAKER SOUND.

-- Stay tuned for more instrument ideas.

Ward Hartenstein

****

EMI'S NEW MAILING ADDRESS

Experimental Musical Instruments has moved its center of operations a few miles down the road. The new address is P.O. Box 784, Nicasio, CA 94946, and the phone is (415) 662-2182. We will continue to pick up mail at the old Point Reyes post office box for the time being, but correspondence sent to the new box will reach us more quickly.

NEW MAILING PROCEDURES

Some changes in EMI's procedures for getting new issues out to subscribers have gone into effect with this issue. With the number of subscribers slowly rising, we are now mailing enough pieces to qualify for the post office's third class basic presort bulk rate on deliveries within the U.S., which are considerably lower than first class rates. They are low enough, in fact, for us to put the newsletter in an envelope to protect it on its journey, and still come out a bit ahead. The envelope also allows for the inclusion of separate flyers such as renewal forms, and creates more space in the newsletter by eliminating the need for a mailing address and some other odds and ends. On the downside, bulk rate delivery times are less predictable. Each new issue of the newsletter will now be mailed a few days earlier relative to the first of the month in the hope that it will still arrive more or less in time.

CORRECTION

The photo credit for the beautiful photograph of Nazim Ozel playing the Semi-Civilized Tree on page 4 of our last issue was inadvertently omitted. It was taken by Mark Constintini.

CONDUIT MARIMBAS AND GLASS MARIMBAS

Designed and built by Stephen Smith

"My woodworking interest came straight out of my music," writes instrument builder Stephen Smith. "I had been reading **Genesis of a Music***, and came across the line '...my father had always maintained a small woodshop; I was familiar with common tools.' This line seemed to stick out at me, as if yelling for my attention every time I read it."

Thus did Harry Partch's suggestion that musicians must become carpenters reach Stephen Smith. Like Partch, Stephen progressed from an interest in alternative scale systems, to a recognition of the need for new instruments to play in new scales, and from there, in the next logical and necessary step, to the workshop.

The instruments he has since made have naturally been types that lend themselves well to the accurate production and retention of particular intonational systems. Most of them are marimba-type instruments. A variety of materials are used for the sounding bars, including wood, glass, and metal tubing. On some smaller instruments, Stephen uses one or another just tuning system. On the larger instruments to be discussed in this article, he prefers to divide the octave into thirty-one equal steps, and accordingly has had to set aside the conventional seven + five keyboard layout. The alternative layouts he uses contribute greatly to playability and, incidentally, the striking appearance of the instruments.

The instruments are beautiful to behold, with simple, handsome designs, thoughtful choice of woods, and fine craftsmanship. But Stephen stresses that when he started five or six years ago, he had few tools and no experience. The Glass marimba was his very first venture into the world of woodworking. His point is that one should not be overly impressed or intimidated by the appearance of craftsmanship. The world of instrument design and construction will open up to a novice with some stick-to-it-iveness; the barriers to entry are not great as they may seem when one views someone else's finely-finished product.

This article will look at two of Stephen's instrument types in particular: the conduit marimbas, made with steel conduit tubing, and the glass marimbas.

For the inspiration to build these instruments, Stephen credits Los Angeles builder and microtonalist Erv Wilson. Stephen's conduit marimbas are the direct offspring of the Tubulongs, a conduit instrument Wilson first created some years ago for the purpose of microtonal exploration. A number of others have built conduit marimbas of one sort or another in recent years. Most of those builders, Wilson included, were influenced by the work of Bill Colvig in the early seventies. Working in Aptos, California, Colvig built (among many other things) a gamelan-like set of justly-tuned instruments using EMT conduit, and these instruments have been used extensively in the gamelan pieces of composer Lou Harrison.

****

*By Harry Partch, Da Capo Press, New York, 1974

THE GLASS MARIMBA

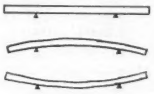
Stephen Smith's glass marimba is a set of sounding bars of glass mounted in a frame, suspended at the nodes over cylindrical tuned resonator tubes. The range is from C5 to C7, with a dry, clear tone quality.

The glass that is used in the bars is single strength plate glass, which is the standard window pane glass, available from hardware stores or glass shops. Glass scraps that are useless to the store or glazier are still often large enough for the bars, and are sometimes available for free.

Smith experimented with plates 1/8", 3/16" and 1/4" thick, and settled on the middle thickness for his bars. This thickness produces a good sound, and will take quite a beating without breaking. In fact, if the player strikes the glass with increasing force, the tone becomes unpleasantly strident before the glass will break -- a fact which neatly discourages abuse of the instrument.

The bars range in length from 8 3/4" for the lowest note to 4 1/2" at the top.

The width of the bars does not effect the pitch. To understand why this is so, consider the way in which a sounding bar moves in its primary mode of vibration, flexing at the middle so that the middle section rises and falls as the ends fall and rise:



For this vibrating pattern, the important factors determining pitch are rigidity at the middle and mass at the ends. Greater rigidity at the middle raises the vibrating frequency, and with it pitch. Greater mass at the ends does the reverse. In the case of a glass bar of uniform thickness, varying the overall width of the bar does not effect pitch, since the increase in rigidity resulting from greater width is offset by the increase in the mass at the ends. Width does effect volume, since a wider bar will push more air. Stephen's bars are uniformly 2" wide.

Stephen cuts each bar to the correct width and the approximate final length with a glass cutter and glass breaking pliers (both of these tools are available from stained glass stores). Tuning then begins. Stephen tunes primarily by shortening the bars at the end; never by altering the thickness of the bar. Referring occasionally to a strobe tuner, he proceeds to nibble away at the end with

glass nibbling pliers, which are pliers made of a softer metal. The job can be finished this way, or a belt sander with course paper can be used for the final touch. If one takes off too much, a small amount of salvaging can be done by using the belt sander to grind down the sides in the middle section of the glass a very small amount, creating a barely perceptible waist. This brings the pitch back down by slightly reducing the rigidity of the middle without reducing the mass at the ends.

To sound effectively, the glass bars must be mounted at the nodes. These are the points which do not move when the bar vibrates in its primary mode, but merely pivot in accommodation to the movement of the material around them:

Given the longitudinal orientation of the vibration in the bar, the nodal points will actually be nodal lines, crossing the width of the bars a little in from each end.

By mounting at the nodes, the bars can be secured in a manner that causes minimal inhibition of the vibration. If the bars are mounted at points which are not nodes -- in other words, which actively partake in the vibration -- the mounting will prevent free vibration and the resonance will be destroyed.

How can one determine the location of the nodes? In wooden marimba bars, where the thickness may not be uniform or the rigidity of the wood may not be constant, there are tricks for doing so which involve actually testing the vibration. In the case of the glass bars, uniform in thickness, width and rigidity, the location of nodes can be accurately predicted mathematically. If the length of the bar is L, they will be located at points .224 x L from each end. .224 is very close to 2/9ths (=.222), so those who prefer may use the fraction rather than the decimal.

THE GLASS MARIMBA

There are as many different mounting systems for sounding bars as there are independent-minded builders. For the glass marimba Stephen rests the bars on strips of foam rubber, about 3/8" wide by 5/16"thick, sold as weatherstripping. This material has an adhesive tape on one side, which is applied to the underside of the glass in two strips at the nodal lines. The other side of the foam is rubber cemented to the wooden frame of the instrument. This system allows for firm adhesion yet easy removal should a bar need to be replaced. More importantly, the flexibility of the foam allows for free vibration.

The glass marimba uses cylindrical tuned resonators of plastic ABS pipe, available at lumber yards and building supply centers. The size that is identified as 1-1/2" has an inside diameter of about 1-5/8" and outside of 1-7/8" (apparently the nomenclature arises from the thickness of cable running inside that the pipe is designed to accommodates); in any case, it is about right for the 2" bars. The resonators on Stephen's instruments are stopped with plugs at the lower end.

There is a mathematical formula for determining the length at which to stop the resonator. Ideally, the vibrating length of the resonator should be the wavelength for the desired frequency divided by four (since a stopped tube resonator encloses one fourth of the total wavelength), less an "open end correction" based on the size of the opening at the end of the resonator. Thus,

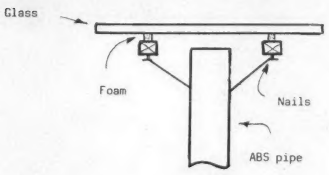
where f = frequency of the note, d = inside diameter of the resonator, and 13,560 = the speed of sound in inches/second,

the sounding length of the resonator in inches should be

$$[(13{,}560/f)/4]-.29d.$$

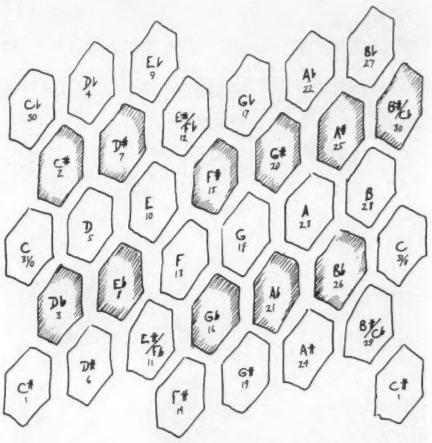
But Stephen has another method entirely for determining the best length: "The way I suggest is to figure your longest note, cut the resonator a bit long, suspend it under the note in the exact manner it will be in when finished, hold a container of water under the bottom and raise it while striking the note. It should be obvious where the resonator should be cut and plugged."

The resonators are hung from nails in the underside of the frame by thin wires passing through holes in the ABS. This allows for adjustments in the distance of the mouth of the resonator from the underside of the bar. By adjusting that distance, one can, within limits, tune the resonator and seek out the best coupling between it and the bar.



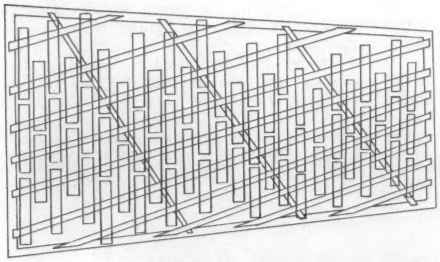
Foremost in Stephen's mind as he worked on these projects was the creation of instruments to make playable scales of a great many tones to the octave. Central to this purpose was the choice of a logical and usable layout for the available pitches. The pattern that he chose is based on the work of the English designer R.H.M. Bosanquet. (1841-1912. His ideas are outlined in **An Elementary Treatise on Musical Intervals and Temperament,** London, 1876.) Bosanquet devised an ingeniously simple and practical keyboard for 53 tones per octave. The basic idea happens also to work well, with some modifications, for other common divisions such as 41, 36, 31, 24, 19, 17, 12 and 7. Harry Partch admired Bosanquet's thinking and referred to it several times in **Genesis of a Music.** The pattern used on Stephen's instruments is an adaption of Bosanquet's keyboard for 31 tones per octave, worked out by by Erv Wilson. Stephen points out some of the logic of the arrangement in the following passage, referring to the diagram below. The numbers refer to the 31 degrees of the scale.

"Whole tone scales run upward to the right (0,5,10,15,20,25,30), half tones run down to the right (4,7,10,13,16,19), and the diatonic scale hovers around the middle (0,5,10,13,18,23,28,31/0) with sharps above and flats below. The beauty of this system is that no matter which of the thirty-one pitches is the tonal center, the diatonic notes will always remain in the same pattern. This in contrast to the juggling of white and black notes one must do every time one changes keys on the piano. The layout can be expanded or contracted up or down, keeping the octave the same distance while modifying the number of notes in the octave."



ERV WILSON'S KEYBOARD PATTERN after R.H.M. Bosanquet

On the glass marimba, the pattern appears as shown below, with all the keys lying in the same horizontal plane.

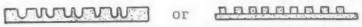


The Glass Marimba -- top view showing the frame and nodal placement (not to scale).

THE CONDUIT MARIMBA

The sounding elements in the conduit marimba are lengths of EMT, or electrical metal tubing, which is a galvanized steel tubing widely available at hardware and building supply centers. The tubing comes in several diameters. Stephen has tried 1/2" and 1", but the diameter of choice is 3/4". The possible pitch range is quite wide; while actual range varies from instrument to instrument. The EMT produces good volume and a fine tone, and over most of the possible range no additional resonators are called for. Resonators similar to those of the glass marimba are generally used below G4 to bring out the fundamental, and instruments without resonators benefit greatly from a reflecting surface about two inches below the tubes, which increases clarity, volume and sustain.

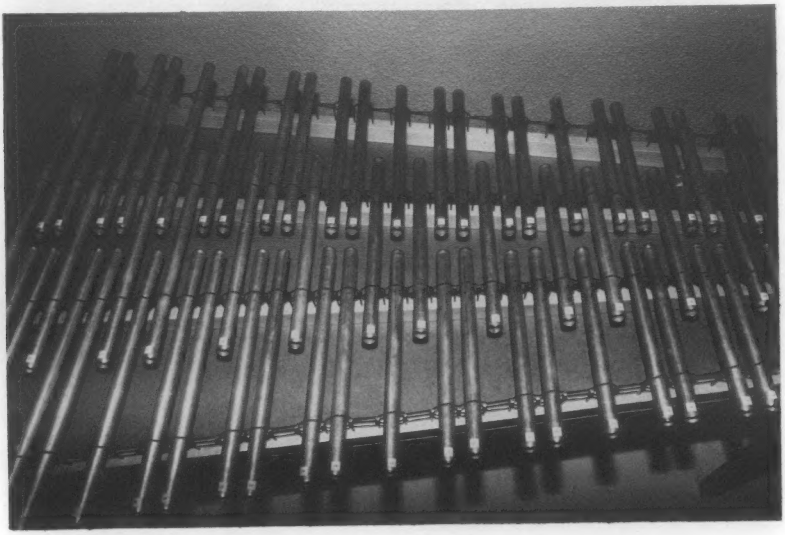
On his earlier instruments, Stephen mounted the sounding tubes, like the bars of the glass marimba, on foam attached to the frame of the instrument. This was done without adhesives by making cutouts in 1" x 2" foam, or gluing additional strips on 1" foam.



This method has two disadvantages. One is that the tubes can fall off. The other has to do with a peculiarity in the way the tubes vibrate. While their wall thickness is uniform in the longitudinal dimension, it is not uniform around the circumference, perhaps because of the seam that runs the length. As a result, a single tube can produce two different pitches, depending on where on the surface one strikes it -- directly on or opposite the seam, 90 degrees away from it, or somewhere in between. The two pitches are within 5 or 10 cents of one another (1 cent = 1/100th of a semitone). The builder must choose which pitch to tune to, and then mount the tube so that the part of the surface that produces that pitch is exposed to the mallet stroke. If the tubes do not stay oriented the same way -- if they are free to rotate in their mounting -- the wrong pitch can sound, or both can sound simultaneously, causing beating.

To avoid this, Stephen has more recently developed an alternative mounting system. He uses scaffolding nails, sometimes called duplex nails, which are the ones with double heads. They are set in a row in pre-drilled holes in the frame. Between the double heads are wrapped two rows of

THE 31-TONE CONDUIT MARIMBA



1/8" nylon stretch cord, available at mountain climbing stores. One such row of nails and cord is set up for each end of the tubes, and the tubes are inserted between the lines, between pairs of nails. If the fit is reasonably snug, the friction is sufficient to prevent the tubes form slipping out or rotating. This system maintains contact only at the nodes, and provides some bounce to allow for excellent sustain.

This system maintains contact only at the nodes, and provides some bounce to allow for excellent sustain.

Since the tubes are uniform in mass and rigidity over their length, the nodes may be located mathematically, as with the glass bars of the other instrument.

The EMT tubes can be tuned by cutting them slightly longer than the estimated tuned length,

THE 53-TONE
CONDUIT MARIMBA

then bringing them up to pitch by grinding the end with a bench grinder. If one grinds too much and goes sharp of the desired pitch, the tube can be brought down again a bit by grinding around the middle, thus reducing rigidity. This looks bad, though, because it removes the galvanizing, causing irregular color and, eventually, rust. For that reason, it is probably better, in this situation, to set aside the too-sharp tube to be used later for a higher note, and start fresh for the original note.

Stephen has built conduit marimbas with thirty-one and with fifty-three tones per octave. The thirty-one tone instrument has the tubes laid out in a 12 + 7 + 12 arrangement, an extension of the traditional 7 + 5. Traditional keyboardists find this easy to use, but it lacks the logic and the transposability of the Bosanquet designs. The tubes are laid in a horizontal plane, and a reflecting surface of masonite lies beneath them. The fifty-three tone instrument, with its two and a half octave range (F4 - C7) and hundred and forty or so tubes, calls for a very special keyboard layout. Like the glass marimba, it uses a form of Bosanquet arrangement, but with the tubes set up in an impressive vertical array. The player strikes the tubes at the ends, and all are thus brought within easy reach. The framework consists of two rectangular wooden frames which support the cords that hold the tubes, resting not quite upright as shown in below on two h-shaped side pieces.

Mallets for conduit marimbas can be a bit of a problem, since yarn-wrapped balls easily slip off the side of the conduit and hit the adjacent note. Smith's solution is to use one-inch hardwood balls (sold as drawer pulls) mounted on 1/4" dowels, dipped in Plasti-dip. Plasti-dip is a synthetic rubber product designed to improve the grip of tool handles. The more one dips the mallets, the softer the attack. Fine control of hardness is easy to obtain, and mallets made this way don't slip. They work well for the glass marimba too.

MORE ON STEPHEN SMITH, HIS INSTRUMENTS, AND RECENT DIRECTIONS.

Several of Smith's instruments are in the hands of microtonal composers and performers in scattered locations around the country. Jonathan Scheuer in Boston commissioned and owns the fifty-three tone conduit marimba described above, and performs on it at the Mobius performance space. Recordings of the instruments, unfortunately, are not available.

In addition to conduit and glass marimbas, Smith makes wooden marimbas, tuned tongue drums (see his letter in EMI Vol. I, #5), various zither-type instruments, aeolian harps and wind chimes. Recently his efforts have been moving away from what had been an intellectual and perhaps esoteric fascination with tunings and temperaments, to an emphasis on instruments designed with ensemble playing and communal enjoyment first and foremost in mind. "So..." he writes, "my current work involves the construction of several large wooden marimbas designed to play contemporary african dance music, reggae, classical and popular tunes on the street. The tuning is 19 tones selected from the 31 tone equal tempered scale to provide a wide tonal palette."

Smith builds all of the instruments described here on commission. "In fact," he says, "my favorite type of work is building large instruments on commission." Of the smaller instruments -- tongue drums and box marimbas -- he usually has a supply on hand for anyone interested in ordering. Photographs of the instruments are available. He is always interested in hearing comments or questions from people, whether they are well versed in these subjects or this is their first exposure. Stephen Smith may be contacted at 423 N. 50th, Seattle, WA 98103; (206) 632-9833.

31-TONE EQUAL TEMPERAMENT

One of Stephen Smith's primary reasons for building marimbas of conduit and glass was the creation of instruments to play in particular intonational systems not available on conventional instruments. His preferred tuning system is 31-tone equal temperament, which divides the octave into 31 equal steps just as 12-tone equal (the predominant system in Western music) divides the octave into 12 equal semitones. This is in contrast to just intonation systems, which base the musical intervals of their scales on the ratios of the vibrating frequencies of the pitches, generally producing highly harmonious intervals in unequal spacing. For Smith, along with most other thinkers on the subject, the test of any equal temperament system is how closely its intervals approximate the simple vibrating frequency ratios of just intonation systems. When it comes to approximating just intervals, thirty-one tone equal temperament is less than perfect on fifths, but the thirds (which are notoriously off in twelve equal) are almost ideal. It also does very well with the septimal intervals (intervals involving frequency ratios in which seven is the largest prime number), which are usually considered to be outside of the tonal range of twelve-equal.

Several equal temperaments have been considered at various times as alternatives to twelve equal, including 17, 19, 24 (in which each step is a quartertone), 31, 41 and 53. 31 is perhaps the most widely used of these. An influential group of composers in the Netherlands, led by Henk Badings, have made the system their primary composing medium, and done much to propagate it. The group was started by Dutch physicist Adrian Fokker, basing his work on the writings of 17th century scientist Christian Huygens.

TEACHING WITH HOMEMADE INSTRUMENTS: THE WORK OF ROBIN GOODFELLOW

In letters and other communications with **Experimental Musical Instruments**, several people have expressed an interest in the use of new and unusual instruments for teaching purposes. The designing and building of musical instruments makes an excellent pedagogical tool, for several reasons. There could scarcely be a better arena for coming to grips with the acoustic foundations of music. Instrument designing can be a fine creative exercise, and at the same time provides a lesson in understanding and appreciating the objects around us rather than taking them for granted. As an activity it is fun; it holds student interest, and serves as a good antidote for the problem of student passivity. And as an added bonus, students frequently come up with excellent and original sound-producing ideas. So it is not surprising that instrument making in the classroom has its enthusiastic advocates.

Robin Goodfellow is one of them. Working from her Oakland studio, she takes groups of students through many and varied music-making activities, from producing basic sound makers through to participation in children's performing ensembles of idiosyncratic instrumentation. She also runs workshops aimed at adults, taking them through similar musical activities both for their own growth and to pass on material for working with children.

In addition to her music work, Goodfellow works in several other genres of arts and crafts, teaching them as skills in themselves and incorporating them in her music teachings. These include Turkish marbling (a method for producing exquisite marble patterns in paint on paper and board), silkscreening, and two styles of paper-cutting producing richly ornate figures and patterns. She has evolved an engaging approach to story-telling for use in teaching younger children, making use of series of hand-held illustrations. The illustrations often appear abstract out of context, but take on programatic meaning in connection with the narrative. The same material has been effectively presented in slide shows as well.

THE TEACHING ENVIRONMENT

To give more sense of Goodfellow's approach to music and teaching, perhaps it will be good to begin with a description of the environment in which she works. Her music room is a wonderland of musical things. Instruments of all sorts are scattered everywhere -- on shelves, on desks and benches, hanging on the walls, in drawers, waiting here and there in informal attitudes, perhaps to be properly put away, but more likely to be picked up by someone and experimented with. It most definitely is not a hands-off museum: the disposition of the whole room encourages exploration. In many situations this style might not be feasible without a lot of controls. Goodfellow can get away with it in part because she works with smaller groups, is not obliged to share her space with other teachers and is always present when students are.

What are some of the instruments?

There are two complete sets of eight anklungs -- traditional definitely-pitched Indonesian bamboo rattles -- one set to an Indonesian scale and one to a Western C major scale.

There are flutes, including orchestral flutes and many varieties of flutes without keys. One is a transparent glass instrument -- a good teaching tool, for if one blows smoke into it one can see the whorls and eddies tracing the movement of the air through the instrument. There are Chinese mirliton flutes, called dragon flutes, which have a thin membrane blown from the young bamboo placed over an extra hole in the tube to do to the flute sound what a kazoo does to the voice. One anomaly is a a free reed of metal, like that of a harmonica or harmonium, mounted in an instrument otherwise resembling a bamboo flute with tone-holes. Free reeds normally establish their own frequency and produce plenty of volume without the presence of a resonating chamber or air column; this one, wedded as it is to an air column with ideas of its own, behaves most peculiarly.

There are fipple flutes of several sorts. Recorders in various sizes, of course, are present; Goodfellow plays them in early music performance ensembles. There are ocarinas in quantity, some quite oddly-shaped. And there are penny whistles. Goodfellow's father was the founder of Goodfellow Pennywhistles, an operation which mass-produced a metal fipple-flute with pennywhistle fingering. The bore was square, narrowing to the far end. The tools and machinery that made those instruments remain in working order, but are mostly idle these days. (Anyone interested in the possibility of putting it back to work should see the note at the end of this article.)

There are bowed psalteries in several sizes. They are the triangular sort, with all the strings in a single plane. The strings are accessible to the bow individually by virtue of the fact that, given the shape, each successive string extends a bit farther along the body of the instrument than the preceding, exposing a portion of its length to the bow without obstruction. Goodfellow also uses these, with their quaint, delicately edgy sound, in early music ensemble performances.

There are sansas, many and various.

The one instrument which is in the hands-off category for the time being is a beautiful hurdy-gurdy, sitting enclosed in its case on the shelf until some maintenance work is done.

And there are many more instruments, including a piano, a personal computer with some music software, and an oscilloscope -- but what's been described here should be enough to establish the style of the place. Suffice it to say that it is a stimulating environment in which to present to children and adults alike the idea of creating their own soundmakers.

THE MANDALA FLUTEWORKS SERIES

Within the last few months Goodfellow has completed a set of small books (text and decorative art by Goodfellow, illustrations by Mary Winn Ekstrom) containing some of the basic elements of her approach to teaching. Each of the six volumes is devoted to one category of musical instruments, in keeping with a set of categorical divisions and labels that Goodfellow has found practical in her teaching. The titles are **Drums, Idiophones, Strings, Reeds, Horns** and **Flutes**, each with the subtitle **Recognition, Construction and Performance.** Each contains a description of its instrument type and the principles by which it works, plus several instruments that children can make from readily available materials, and a complement of activities, pieces and games.

Cutout design on the cover of one of the books of the Mandala Fluteworks series.

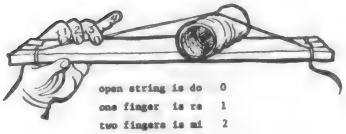
One of the striking qualities of the books is their brevity of text: explanation is minimal; suggestion is the thing. Children will sense how to put things together by taking in the illustrations, simple though they be, far more than by following written directions. One can easily imagine that in doing so they will operate by broad principles gleaned from observing and experimenting, rather than by specific parameters laid out in advance. Perhaps this is risky; there is plenty of room for mistakes -- but all of this is in keeping with Goodfellow's exploratory approach to teaching and learning.

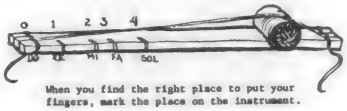
From among Goodfellow's teaching materials, we'll select a couple of particularly enjoyable instruments to look at here in a little more detail. These are the soda straw instruments, which she illustrates in simple form in the **Reeds** book, and elaborates further in classroom activities.

SOME SAMPLE CLASSROOM INSTRUMENTS:
SODA STRAW OBOES AND CLARINETS

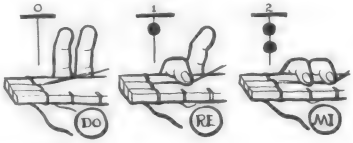
Goodfellow and her students make clarinets by cutting a tongue to serve as an idioglottal reed near one end of a drinking straw, as shown in the page reproduced above. ("Idioglottal" here refers to the fact that the reed is of a piece with the rest of the body of the instrument, not made separately and attached.)

FINDING NOTES ON A MONOCHORD





When you find the right place to put your fingers, mark the place on the instrument.



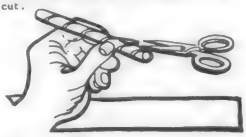
Above: an example of Goodfellow's textually brief but visually explicit style in introducing an idea.

MAKE A SINGLE REED INSTRUMENT

Soda Straw Clarinet

1. Cut a long straw in thirds.

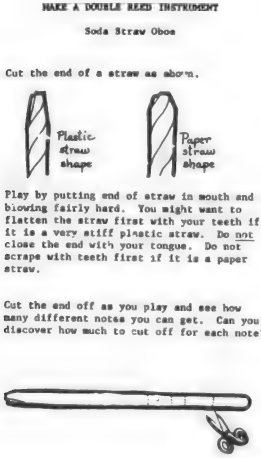
2. Cut a slit with scissors. Slit should be very narrow and straight. Press straw with thumb to get a good edge to cut.



3. Flip reed up and press flat with thumbnail making it lie at the angle shown.

11

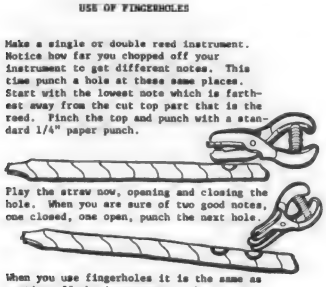
They also create idioglottal oboes:



The tone of the clarinet is rather subdued, and the instrument is not always fully cooperative. The oboe, by contrast, is loud and shrill.

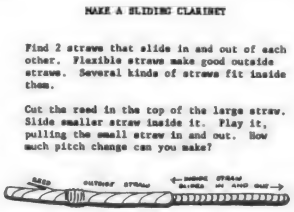
The great thing about the soda straw instruments is that the time and expense involved in making them is so slight, one can make them, use them, experiment with them, and in doing so perhaps destroy them, quite unconcernedly. In her classes and workshops Goodfellow does a fun and funny demonstration in which, in the midst of a lively running narrative, she creates (effortlessly, in a matter of moments) a full-length soda straw oboe; then, scissors in hand, snips an inch or so off the end to illustrate the rise in pitch with the shortening of the column; then, with bits of soda straw flying everywhere, proceeds to snip her way through a major scale at a nice brisk tempo, with impeccable intonation.

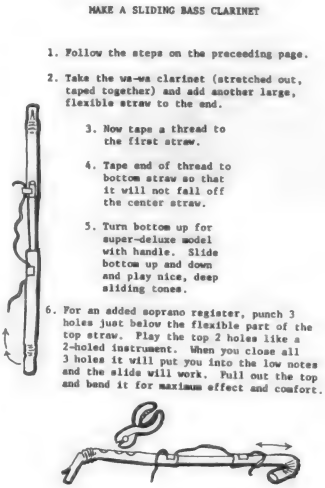
Goodfellow uses a hole punch to create tone holes in the instruments.



Achieving accurate intonation on these instruments is not always easy, even if the tone holes are carefully placed. Goodfellow herself has become a master though; she can play a bagpipe piece or a bright folk melody at the liveliest of tempos, with fine intonation, all to wonderful effect.

After exploring the possibilities of the tone-hole instruments, Goodfellow looks to the creation of slide instruments. Very conveniently for this purpose, it turns out that the widely-available flexible plastic straws generally have a slightly larger diameter than the red-striped straight ones. The latter fit within the former, and they seal adequately and slide nicely.





A wild and wonderful instrument is the clarinet with both slide and tone holes mentioned at the end of the pages reproduced above. It is built like the "bass" slide instrument, but with tone holes in the upper joint. As long as any of them remain open, the tone holes will be the operative factor determining the pitch produced; the rest of the instrument remains passive. Close all the tone holes, and the lower end -- the slide -- suddenly comes into play, with a lower pitch range and, inevitably, a very different melodic style. Goodfellow creates antiphonal exchanges between

the two modes of operation in her performance on the instrument; it's an unexpected, appealing, comical effect.

FOR MORE INFORMATION...

The books of the Mandala Fluteworks series can be ordered through Lark in the Morning, Box 1176, Mendocino, CA 95460 (a wonderful outlet for everything unusual in music -- be sure to get their catalog). Or they may be ordered direct from Robin Goodfellow, 1655 Vista, Oakland, CA 94602; (415) 530-7835. For orders through Goodfellow the price is $7.50 plus postage and handling for all six books in the series.

Companion books to the series are in preparation now, exploring the stories, history and lore of each instrument type. After that, a series on acoustics is planned.

Anyone interested in speaking to Goodfellow about classes or workshops can contact her at the above address and phone.

The Goodfellow Pennywhistles factory mentioned in the article is available for sale, lease, rent or trade for production of pennywhistles. Contact Goodfellow at the address given above for details.

****

The books section of this issue of EMI contains a listing of additional musical instruments books for young people.

LEONARDO CALLS FOR PAPERS ON ART AND SOUND

The editors of the highly-regarded arts journal **Leonardo** are inviting artists and others to submit articles on work involving visual art and sound for publication.

Leonardo is the journal of the International Society for the Arts Sciences and Technology. It is a scholarly journal without the lifelessness that the term often connotes, beautifully produced and printed, and with high standards for content and quality of writing.

Artists whose work combines elements of visual art with actual sound or music, or whose work otherwise involves ideas related to music and contemporary science and technology, are invited to submit articles on their work. Historians, theoreticians, philosophers and other researchers are also invited to submit articles on aspects of their work that relate to this theme.

Editorial guidelines may be found on the outside back cover of the journal. Additional information may be obtained from the main editorial office: **Leonardo**, 2112 Berkeley Way, Berkeley, CA 94704.

Subscriptions to **Leonardo** are $30/year for individuals, from Pergamon Press, Fairview Park, Elmsford, New York, 10523.

EVENTS

NEW INSTRUMENTS / NEW MUSIC
A Series of Concerts by New Instruments Makers

TIMES:	2:00 pm on the first Sunday of each odd-numbered month.
PLACE:	3016 25th Street, San Francisco, CA 94110
DONATION	$5.00 per person
INFORMATION/ RESERVATIONS	(415) 282-1562

A new series of concerts devoted to music by makers of new and unusual instruments has just begun. The concerts will be taking place bi-monthly, and they will be hosted by Tom Nunn at his studio in the Mission District of San Francisco. Several different builder/composer/performers will be appearing in the course of the series, and it should be quite an adventure.

The first concert took place on May 4th, 1986, featuring the work of Prent Rodgers of San Jose and the series host, Tom Nunn. Nunn played the Crustacean and Earwarg (which have appeared in **Experimental Musical Instruments**), along with a number of other oddities. Rodgers played his remarkable balloon flutes, aero-membranophones, bowed megalyra, spring bass and several more. Most of Rodger's instruments explore microsonics, using pickups and contact mikes to bring forward sounds that would otherwise be too quiet to be musically accessible. The interplay between the two musicians and their instruments -- the mix of sustained and staccato sounds, massive sounds and fine sounds, low and high frequency sounds, justly-tuned, randomly-pitched, ambiguously-pitched and unpitched sounds -- proved fortuitous and effective in their series of five or six thoughtful improvisations.

One of the great things about this concert -- and this should be true of those to come in the series as well -- was the intimacy of the environment. This is what chamber music is about: a small, informal performance space and a small, attentive audience; performers who are free to talk about and explain what they are doing; the special proximity of the sound and the soundmakers. With any concert this brings an immediacy to the music; with a concert of new instruments it becomes especially valuable as everyone can see the instruments and their workings close at hand, hear their sound at its best, ask questions about them and even play them between numbers. All in all, great idea.

The next concert in the series will take place on July 6th (complete information above). It will feature Chris Brown (builder of, among other things, the Wing and Gazamba discussed in EMI Vol. I #3) joined by Tom Nunn. Make a note of it.

13

A BIBLIOGRAPHY FOR AVAILABLE-MATERIAL INSTRUMENT MAKING

With an emphasis on children's books and teaching materials

by Tony Pizzo

In conjunction with the article on Robin Goodfellow, her teaching and her Mandala Fluteworks series of children's instrument books, we devote this issue's regular "Books" column to an overview of bibliographic resources relating to homemade instruments for young people and teachers. The author of the bibliography is Tony Pizzo, builder of many instruments, teacher with extensive experience in the classroom and workshop with both adults and children, and author of the book, soon to be published by Scribner's, **The Maker Played Instrument.**

INSTRUMENT MAKING BOOKS FOR CHILDREN

MAKE MINE MUSIC, written and illustrated by Tom Walther (Boston: Little, Brown and Company, 1981)

The best of the brown-ink-and-line-drawing books on instrument making. It's written for kids, but doesn't talk down to them and covers a lot of ground in a lively, informal style. Clearly-drawn instructions for making a wide range of available-material instruments are scattered throughout the text, which covers acoustics, families of instruments and world music.

SIMPLE FOLK INSTRUMENTS TO MAKE AND PLAY, by Ilene Hunter and Marilyn Judson (NY: Simon and Schuster, 1977)

You could keep a kid off the streets clear up until puberty by making all the instruments in this book, which includes plans for most of the simpler available-material instruments which you may find in other books. The difference is that all of these plans will work. Heavy on the percussion, but also includes string and wind instruments. Of particular merit are the "Quick and Simple" designs at the end of each chapter which are just that.

MAKE YOUR OWN DULCIMER USING COMMON MATERIALS, by David Cross (Backyard Music, PO Box 9047, New Haven, CT 06532, 1981)

A neat little booklet which tells you how to make a creditable available-material dulcimer featuring a cardboard soundbox. David also publishes a companion booklet for kids called "Meet the Friendly Dulcimer," and has kits available for sale.

AMERICAN FOLK TOYS: HOW TO MAKE THEM, by Dick Schnacke (NY: Penguin Books, 1973)

Technically this is not an instrument making book, but both these activities are closely related in that they involve invention and movement. And like the Hunter/Judson book, all your favorites are included here, and they work!

While I'd consider the books above your best bets, you may want to take a look (or a chance) with the following, listed in order of preference.

RESONANT RUBBISH, by John Brune (London: English Folk Dance and Song Society, 1974).

MUSICAL INSTRUMENT RECIPE BOOK, Education Development Center (NY; McGraw Hill, 1968)

FLUTES, WHISTLES AND REEDS; SINGING STRINGS; HORNS by Larry Kettelkamp (William Morrow, 1962, 1958, 1964)

HOMEMADE MUSICAL INSTRUMENTS, by Tom Keynton (NY: Drake Publishing Co., 1975)

MAKING MUSICAL THINGS by Ann Wiseman (NY: Scribners, 1979)

****

INSTRUMENT MAKING BOOKS WRITTEN ON AN ADULT LEVEL, but which include projects suitable for the classroom or home.

FLUTECRAFT, by Mark Shepard (Distributed by Monty H. Levenson, PO Box 294, Willits, CA 95940)

A clearly written and manageable introduction to the acoustics of the flute, including instructions for making a bamboo flute.

MAKING FOLK INSTRUMENTS IN WOOD, by Dennis Waring (NY: Sterling Publishing Co., 1983)

A very well done overview of string, wind and percussion instruments made from available materials. This book includes both simpler instruments of the type found in Hunter/Judson as well as a section including more sophisticated string instruments, tool technique, resources and other related information. A strong point of Waring's book is the inclusion of accurate and uncomplicated plans for a teardrop fiddle, hammer dulcimer, fretless banjo, mountain dulcimer, and Celtic harp; all of which are among the best I've ever seen for these instruments at this skill level, with the added advantage that they're all in one place.

VIBRATIONS: MAKING UNORTHODOX MUSICAL INSTRUMENTS, by David Sawyer (NY: Cambridge University Press, 1977)

An influential book. A good number of the instruments described were later included in other books, but the real value of VIBRATIONS lies in its emphasis on the process of discovering and developing instrument designs and the use of maker played instruments in ensemble. There are some intriguing uses of fan resonators described that should keep you up for a few nights, some pithy thoughts on scoring for new instruments, and rare plans for ceramic flutes and ceramic chimes.

SOUND DESIGNS, by Reinhold Banek and Jon Scoville, (Berkeley: Ten Speed Press, 1980)

Most readers of **Experimental Musical Instru-**

ments will probably have already heard of or more likely own this book, and justifiably so. The designs require more sophisticated tools and techniques than most other books of this type, but the authors give good clear instructions for how to handle it if you've a mind to take it all on. Strong on pitched percussion, particularly using plastics and metals. About fifty instruments are described, many of them original applications. This book is an excellent goad to the imagination, and provides plenty of resource lists to help point the way.

MUSICAL INSTRUMENTS MADE TO BE PLAYED, by Ronald Roberts (Leicester: The Dryad Press, 1968)

The granddaddy of them all. Roberts' book was the first book to go beyond the rubber-bands-on-the-shoebox approach to available material instrument making and is still a good place to start. Includes instructions on the now common pitched percussion instruments, but has particularly good plans for a resonated glockenspiel and is still the best place to find plans for zithers, the kantele (Nordic psaltery) and bowed psaltery. Another strong point of this book is the set of full size templates included in the early editions.

THE MONTESSORI HARP: FULL SIZE PLANS, by John Maluda (available from John Maluda, 1901 Ashmoor Lane, Anchorage KY, 40223).

Mr. Maluda is drafting plans for a series of Montessori-approved children's instruments, and these are the first plans he has published. A good project for a teacher or other adult handy with tools.

THE MOUNTAIN DULCIMER... How to make it and play it (after a fashion), by Howard W. Mitchell (Sharon, CT 06069: Folk Legacy Records, 1965)

A book and record set detailing Mr. Mitchell's investigations into acoustics in general and the manner in which they apply to the mountain dulcimer in particular. This modestly-presented record of only some of Mr. Mitchell's work, now twenty years old, has been extremely influential among many youthful instrument makers and his generous sharing of information has helped spark the revival of lutherie in America.

This book is well worth tracking down. Information on playing techniques and the use of hollow core door ply in the making of a large psaltery (as far as I am aware it was the first real appearance of "available material" instrument making suggestions) make this book and recording as fresh and important as it was when it first influenced all those kids in the sixties.

You might also try to track down Mr. Mitchell's similar investigation of the hammered dulcimer, also available on Folk Legacy.

****

MUSIC INSTRUCTION USING STUDENT-MADE INSTRUMENTS: Theory and Practice

CREATIVE MUSIC FOR CHILDREN, by Satis Coleman (NY: G P Putnam's Sons, 1922)

Worth tracking down. The account of a pioneer in available-material instrument making with children. Coleman's approach was based on allowing children to follow their own developmental impulses in instrument making and playing and observing how their discoveries paralleled the history of man's musical development.

EXPERIMENTAL MUSIC IN SCHOOLS, by Brian Dennis (London: Oxford University Press, 1970)

A "new music" approach to teaching composition in the schools. A companion book to VIBRATIONS (above). Covers subjects from awareness of sound and simple scores and improvisations all the way up to more elaborate scores and electronic music in the classroom.

NEW SOUNDS IN CLASS, by George Self (London: Universal Editions, 1967)

Somewhat similar to Dennis's book (above), but includes more scores.

AFRO ENSEMBLE: A BEGINNING BOOK, by Lynne Jessup (Fort Worth: Harris Music Publications, 1975)

An excellent introduction to traditional African percussion patterns clearly and simply notated for drums, clave, bells, shaker etc. Useful resource materials are also listed.

DEVELOPMENT OF MATERIALS FOR A ONE YEAR COURSE IN AFRICAN MUSIC FOR THE GENERAL UNDERGRADUATE STUDENT, by Vade E. Butcher and others (Washington DC: Dept. of HEW, 1970)

Of particular value as a bibliographic and educational resource for those interested in studying African and Afro-American music in depth.

THE KODALY METHOD, by Lois Choksy (NJ: Prentiss Hall, 1974) and THE KODALY CONTEXT, by Lois Chosky (NJ: Prentiss Hall, 1981)

(Suggested by Robin Goodfellow) The theoretics and practical method of using Kodaly's approach to the teaching of music in the classroom.

MUSIC-SOCIETY-EDUCATION, by Christopher Small (NY: Schirmer, 1977)

An investigation of how a society's attitude towards music is reflected in the manner in which it presents the study of music to children. Critical of the European tradition, the author presents a model for personal involvement with the study and enjoyment of music inspired by the traditional approaches of the third world. A thought-provoking book which can provide a theoretical basis for alternative music education.

THE TUNING OF THE WORLD, by R. Murray Schafer (Philadelphia: University of Pennsylvania Press, 1980)

This book is a history of our perception of sound, of the changing interrelationship between natural sounds and those produced by man, and of the effects of this evolution on us. Read carefully, it can serve as a series of exercises designed to sharpen our awareness of what Schafer calls the "soundscape."

RECORDINGS

DOG OF LARD, plus some other recordings by LARD Cassette tapes available from RRRecords, 151 Paige St., Lowell, MA, 01852, for $5 plus $1 postage. LARD may be contacted through Manor Multimedia, P.O. Box 19152, Kansas City, MO 64141.

THE NIHILIST SPASM BAND, VOL. 2
LP record on Music Gallery Editions. Available from Chimik Communications, P.O. Box 1415, Station H., Montreal, Quebec, Canada H3G 2W4. Other recordings, including the more recent "1984," available through Chimik and RRRecords, address above, for $7. The Nihilist Spasm Band can be contacted through Greg Curnoe, 38 Weston St., London, Ontario, N6C 1R1.

Perhaps these two recordings should not be reviewed together as if they were two peas in a pod. Their musical and aesthetic purposes are really quite different. But they have in common the fact that both use intentionally crude home-made electronic, electric and electro-acoustic sound sources as the basis of their sound. Sound sources intentionally based on inferior, damaged or misappropriated electronics have enjoyed some popularity lately. Although the resulting sounds are frequently awful, they can be awful in interesting ways, and so provide some fertile ground for exploration. In many instances electronic signals just don't behave like acoustic ones. High quality sound equipment refines away most of the irregularities, but everyone knows what poor or overloaded equipment can produce: unnatural overtones, weird attack, irregular variations over time in what should be a constant sound, etc. Add to this the further possibilities in deliberately altered or misused electronic and electromechanical systems, and an awful lot of sound possibilities begin to appear. One can take these side effects of electronic sound production and refine them for use in a more controlled manner, as, for instance, the scratchy turntable virtuosos have done, as the gloriously distorted garage-bands do, or as a lot of early electronic music composers did with techniques like ring-modulation (which generates unnatural and sometimes unpredictable harmonics based on two input frequencies). Alternatively, one can look upon the electronic flotsam as found sound: you stumble across a new effect; if you like it, enjoy it; if you don't like it or grow tired of it, throw it away.

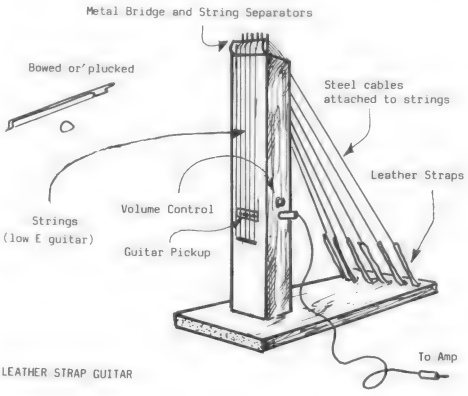
LARD and The Nihilist Spasm Band build their own instruments, but in exploring the resulting possibilities both groups lean toward the found sound approach. Of the instruments they use, LARD's John Sandin has said (in communications with EMI), "They were intended to be constructed for maximum effect with a minimum of effort, and put aside when their possibilities were, for us, exhausted." Similarly, Hugh McIntyre of NSB comments in the record's liner notes, "The instruments are slowly but constantly changing....It takes a couple of years to explore the potential of a newly-built successful instrument. Of course, there have been failures which were quickly discarded."

John Sandin and Steve Sweigart are the essential components of LARD. They have been playing and recording together in Kansas City for about three years. Their music takes the form of long, spacious explorations of timbres which all seem to sound like distorted electronics, but which are nonetheless quite varied. Some of it definitely qualifies as ugly-industrial -- jarring and intrusive and unsympathetic. A lot of it, on the other hand, is thoughtful, engaging, even lyrical. The progression of the music is exploratory rather than formalized. Avoidance of recognizable tonality and metric structure -- a big concern in some early modern music, remember? -- is definitely not an issue here: meter and tonality simply are not part of this world.

An intriguing mix of sound sources appear on the Dog of Lard tape. In the resulting collage it is difficult to identify them individually by sound, especially given the capacity of electronic sound reproducers to disguise their sources. We should mention, too, that the cassette contains no liner notes at all, so the listener is very much on his own -- perhaps deliberately so -- in interpreting the sounds. Sandin lists the sources used in Dog of Lard as follows:

Malfunctioning hair dryer
Amplified/distorted panpipe whistles
Amplified/distorted flute
Vacuum cleaner/whistle
4 track "mellotron" with flute sound source
Amplified/distorted bass drum
Leather-strap tension adjusted electric guitar
Bowed cymbal
Slowed Jew's harp

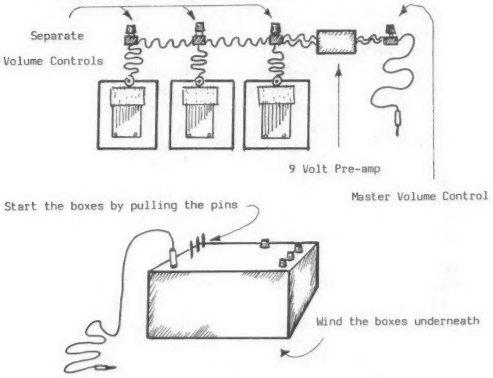
The leather strap guitar is a neckless strings-and-pickup device, with the strings attached to cables attached to straps which are fixed at the far end. The player presses the straps with his feet to adjust string tension (thus no need for a fingerboard). The string may be plucked or bowed.



LEATHER STRAP GUITAR

The 4 track "mellotron" is a 4 track tape recorder with a single note, from any sound source, recorded on track one, for the entire duration of a reel of tape. Another note, again from any source, goes on track two, and others on three and four. The tape runs continuously during performance, and the output is controlled from a separate box which acts like a 4-note keyboard, but with the added maneuverability of pitch (i.e., tape speed) control and volume control.

Other recordings by LARD have included distorted skipping records, wire egg slicer scraped with microphone with reverb, a parakeet training record with a champion talking parakeet played at slow speed, and numerous other oddities. A recent addition to the ensemble is an as-yet-unnamed arrangement of three separately-controlled amplified lamellaphone music boxes. The cylinders have had their teeth filed away at random, rendering their songs unrecognizable.



MUSIC BOX INSTRUMENT. The innards shown above fit in the wood and metal box below.

Sandin says of this one, "When distorted, it has an incredibly powerful and varied range -- many possibilities. The element of chance has a major role in the sound quality."

LARD's cassettes are produced by improvising with the tape recorder running, then editing the resulting tape, using various techniques to get around a lack of sophisticated recording studio equipment. They have released four such edited tapes, and a live performance tape is also available, all from the address given at the start of this article.

The Nihilist Spasm Band is comprised of John Boyle, John Clement, Greg Curnoe, Bill Exley, Murray Favro, Hugh McIntyre and Art Pratten. The band was organized in London, Ontario, where, according to the liner notes, they have performed publicly every Monday night for thirteen years, for audiences ranging from large to small to zero.

The group engages in the free-est form of free improvisation they can freely manage to produce; most notably, free from the constraints of any sort experience with music aside from their own contrivances. To quote the quote that was also quoted in the NMDS catalog, "No member of the Spasm Band plays a traditional instrument either in the band or anywhere else. In other words, even if we wanted to play Melancholy Baby, we couldn't."

The group's instrumentation is always in flux. At present the drummer plays a trap set comprised of a variety of struck items, some amplified and some not, including a large galvanized steel saucer on a cymbal stand, and a drum which uses the speaker from a discarded bass amp operating in reverse as a microphone. Other members of the group play several fretless guitar-like affairs, some of which are bowed. One man plays several glorified and amplified kazoos, with extra-large horns and feedback-resistant pickups made with hearing-aid ear-pieces (operating, like the woofer-mike described above, in reverse). The theremin that once was a part of the ensemble has stopped working and replacement transistors have been hard to find, so it is out of the picture for the time being.

MODIFIED AMPLIFIED KAZOO built by Greg Curnoe

Most of the instruments are modified some or all of the time by wah-wahs, compressors, equalizers, and ring modulators. The pickups on the amplified instruments are often homemade, including one somehow made by one band member from another's refrigerator door seal.

The album jacket for NSB Vol. 2 has good photographs and descriptions of some of the instruments the group uses.

The group's singer, in early performances, used a large megaphone. Subsequently he came to prefer wearing a gorilla mask and vocalizing through a microphone. More recently he has had a fold-up booth built, roughly the size of a shower stall, curtained off with old sheets. He sings from within, makes it sway back and forth, and allows his hands or other body parts to emerge into the audience's view from time to time. With the dramatic and provocative nature of the singer's presentation and the extraordinary appearance of the instruments, the visual aspect of the group's performance is central to the overall effect.

The Nihilist Spasm Band's music is uniformly raucous and loud. The liner notes for the record recommend playing at high volume levels. The

17

overall sound is reminiscent of a disoriented garage band, but once again completely free of recognizable tonality, pulse or meter. There is a very definite sense of phrasing and punctuation though, generally built around the vocal part and reinforced by the instruments.

The vocal parts are performed in a madman's declamatory style, shouted with a repetitious, expressionless urgency. The texts, incidentally, are the one element not totally improvised -- they are written down, in skeletal form at least, before the performances. A sample, from the piece entitled "Stupidity":

STUPIDITY.
Stupidity is disgusting. Repulsive.
Obnoxious. Cretinous. Wasteful.
Stupidity.
Stupidity is typical. Common. Everywhere.

...and so on.

The music is not for everybody. It does make a kind of sense though. It justifies its existence just by being what it is, whether or not a lot of people will want to listen to it.

EDITORIAL, continued from page 1

they operate musically. In some cases, to do this effectively and present a complete picture, some dense technical language seems unavoidable.

On the other hand, a surprising amount of the acoustic happenings that we can control in instrument building are comprehensible through common sense, or in any case are sufficiently explainable to be reasonably accessible to most people. For those especially interested in the more theoretical acoustical considerations, there are publications which do a far better job in dealing with them than EMI can. For as esoteric as our subject matter may seem to some, EMI is a generalist's publication: we talk about all kinds of sound producers; we would like to be able to reach anyone with an interest in the subject; and we do try to present the big picture.

So where do we come down on the technicality vs. accessibility question? When comments have come in from readers on the subject, they have generally favored (though not by a great margin) a journal that is less technical; that is practical without becoming highly theoretical. Our policy will continue to be this: we will try our best to do the near-impossible -- that is, to make each article accessible, if challenging, to those new to the subject, and at the same time interesting, thought-provoking and informative to those with a strong background. Where this seems truly unmanageable, we will take to heart the comments of the readers who have asked for fewer barriers to understanding. But we will continue to indicate where interested readers, perhaps those with a more technical bent, can turn for further information. And, of course, there will always be some variation from article to article within a given issue.

A second editorial question that keeps cropping up is, just what instruments does EMI cover? As long as we are talking about experimental instruments, the answer to that will be one wonderful question mark. Anything goes.

But there is one category -- one rather prominent one -- that EMI has avoided thus far. That is the category of purely electronic instruments, particularly purely electronic keyboards, and most particularly, synthesizers. Why de-emphasize these? Firstly because it is our judgment that most people who subscribe to EMI do so because of an interest in acoustic events, rather than electronic events within a computer chip. Secondly, several publications exist which cover the subject of electronic music very well.

Still, EMI is interested in and has occasionally reported on unconventional uses of electronics, including misappropriated electronic hardware, the capturing of quirky electronic "found" sounds, and the like. We also have in the planning stages an article or two on digital sampling and signal processing techniques, because of their special relationship to original acoustic sound sources. And, of course, we have covered electro-acoustic explorations extensively.

CONTRIBUTING TO
EXPERIMENTAL MUSICAL INSTRUMENTS

We would like to remind everyone that EMI always wants to hear from you. Your letters, articles, article topic suggestions, coming events notices and the like all help the newsletter serve everyone better.

We are happy to read unsolicited manuscripts, but if you are interested in writing for EMI, a good place to start is with a phone call or note to the editor describing what you have in mind (please notice that we have a new address). This will ensure that you and EMI know what to expect from each other regarding length, style, emphasis and the like. The newsletter cannot pay for articles, but we do cover reasonable expenses and provide the author with free multiple copies. And, of course, the non-monetary rewards of having one's work appear in EMI are beyond measure.

Any number of topics can be appropriate. Subscribers will have some sense of what EMI and its readers are interested in from what has appeared in the past, and of course we are always open to new ideas. At present we have a special need for shorter articles of one or two pages -- that's somewhere between three and eight pages double spaced typescript. There are a few topics we'd like to suggest in the hopes that someone reading this might have the background and the interest to follow up: 1) Bird calls and other game calls; the different types, how they work and where to get them; 2) a sort of guided tour of

some of the wonderful sound sculptures permanently installed in public places in the U.S. and elsewhere; 3) different types of strings available, what gauges and materials are best for what application, where to get them, etc.; similarly, suggested materials for drumskins; pros and cons of different metals for chimes and metallophone bars, and similar practical discussions of sounding materials in instrument building; 4) any topics in practical acoustics providing background knowledge based in and directly applicable to instrument design, especially of the "teaching them to fish" sort ("Give me a fish and I eat for a day; teach me to fish and I'll eat for a lifetime" -- old adage from who knows where). Also, for some coming articles, we are interested in any information on use of oscilloscopes in instrument tuning, and on gourds and bamboo as raw materials for instrument construction. Finally and perhaps most importantly, articles on one's own work are always appropriate. The builder is certainly in a better position to describe his own instruments than anyone else. On the other hand, if your work is worth describing in EMI but for whatever reason you are reluctant to undertake authorship yourself, we can often write a respectable article on this end with your cooperation in communicating information, proofreading and making corrections.

If you are not interested in writing an article but do have something to say that is worth communicating to the readership as a whole, be it of major or minor significance, write a letter to EMI. Getting letters is great fun on this end, and EMI's letter column thus far has been a treasure chest of comments, suggestions, insights and information.

Individuals can also communicate with the readership as a whole through the notices column. EMI prints notices of up to forty words from subscribers free of charge.

SHOULD WE PRODUCE TAPES?

In the very first issue of Experimental Musical Instruments, a notice appeared asking for reader response on the question of whether EMI should make recordings of the instruments described in the articles available on cassettes. Response to the idea was minimal, probably in part because EMI's readership at that time was minimal. So we raise the question again now.

There can be no question that writing about a sound cannot convey the whole story; if people really want to know what the instruments are about, they've got to hear them. But producing the cassettes would entail a lot of work and expense, and we would not undertake it unless we felt confident that a goodly number of people would want them.

It so happens that most builders have managed to make recordings of their instruments available in one form or another, however informally. As a result, EMI's articles on particular instruments have usually been able to include information on how to obtain a recording. we've gotten reports that a number of readers do indeed follow up and purchase tapes. Still, it might be a valuable service for the newsletter to put together one or two cassettes a year containing samples of several of the instruments covered during the year, making a variety of materials available from a single source. The cassettes could be made available separately, or as part of an optional special subscription at a slightly higher price.

If you think this is a good idea -- or, more to the point, if you would follow through and purchase such a cassette -- do let us know. If we do not hear from many people, the idea goes back to the back burner.

EMI'S FINANCIAL HEALTH

We end this overview of the state of the newsletter with a glance at its bottom line. At the time of this writing EMI's subscribership stands at about two hundred and thirty. That is a humble number, but it has been slowly growing. We also have been selling quite a few back issues. The newsletter's expenses are fairly modest, and the flow of income from these sources has been roughly equal to current expenditures. It remains a long way from repaying the startup costs of the newsletter, most notably the purchase of the personal computer which is the nerve center of the whole operation. This state of affairs is essentially what had been predicted and expected when the decision was made to begin publishing. In terms of the foreseeable future, it means that EMI will continue to publish on the same schedule and under the same financial arrangements.

The best thing that can happen to the newsletter from a financial point of view is the sale of ever more subscriptions and back issues. We heartily encourage everyone to bring others into the fold. Please encourage friends and relations to subscribe, give gift subscriptions, leave copies lying around conspicuously when people are coming over to visit, proclaim the newsletter's merit in public forums -- these things will help ensure EMI's healthy survival and continued improvement in serving our community of interest.

NOTICES, continued from page 20

The Second Convention of the Society of Folk Harpers and Craftsmen will be held on the campus of the University of Southern California in Los Angeles, 6/28/86 to 7/1/86. For more information write Sylvia Fellows, P.O. Box 2951, Los Angeles, CA 90029.

The biggest music business trade shows are the NAMM (National Association of Music Merchants) expositions. These are huge affairs, very commercially oriented, but, from all reports, very interesting. They are always strong on the latest electronic hardware. The next show is NAMM Expo '86 at McCormick Place in Chicago, June 14-17. For more information contact NAMM, 5140 Avenida Encinas, Carlsbad, CA 92008.

RECENT ARTICLES APPEARING IN OTHER PERIODICALS

Listed below are selected articles of potential interest to readers of **Experimental Musical Instruments** which have appeared recently in other publications.

AMC News No. 9, Spring 1985 (Australia Music Centre, 80 George St. North, The Rocks, Sydney NSW, Australia) is a special "Composing the Instrument" issue, featuring the work of several Australian instrumental innovators. Included are: Moya Henderson, who works with sets of large, tuned, resonated triangles as well as modified violins and 'cellos; Alestair Riddell, who builds acoustic pianos with elaborately designed electronic actions allowing for extended timbral possibilities with very fine control along several parameters; Sarah Hopkins, who works with sets of tuned "blooper tubes;" Ernie Althoff, who makes musical Rube Goldberg devices from common household items, and Herbert Jercher, who built the Bika-bang-blik-a-phone, a large and loud arrangement of rods which strike metal tongues welded to a gas tank resonator, driven by a person pedaling a modified bicycle; and many others.

THE BLUEGRASS DOBRO: AMERICA'S SECOND NATIVE INSTRUMENT, by Bobby Wolfe, in **American Lutherie** #5, Spring 1986 (8222 South Park Ave., Tacoma, WA 98408).

A fine and informative article describing the dobro and how it works and giving some history. The dobro is truly a unique instrument, designed like no other with its internal metal cone resonator set inside a guitar-like body.

THE TRAVIELO, by Ernest Nussbaum, also in **American Lutherie** #5 (see above).

A description of the creation of an electrified 'cello, made to replicate the traditional 'cello's feel and sound in a package small enough to fit under an airplane seat.

CHECK YOUR OIL? by Michael A. Greer, in **Techni-Com** Vol. 9 #6, Dec. '85 - Jan. '86 (Box 51, Normal, IL 61761).

A report on an extraordinarily effective space-age lubricant for woodwind keys, originally used to lubricate camera parts on the Venus and Saturn unmanned satellites.

Untitled, in **Techni-Com** Vol. 10 #1, Feb. - Mar. '86 (address above).

A very short piece on the RAAD violin, viola, 'cello and bass, developed by Dick Armin and manufactured and marketed by RAAD Instruments of Toronto. They are electric instruments designed to duplicate the performance of acoustic bowed strings, with a number of design innovations including an innovative body shape and a floating top plate. A more complete discussion of the instruments appears in **Musicworks 28**, Summer 1984 (1087 Queen St. West, Toronto, Canada, M6J 1H3).

Ivor Darreg's **1985 Annual Report** (available from the author/publisher at 4028 Boundary St., San Diego, CA 92104).

Each year the irrepressible microtonalist, instrument builder and Renaissance man Ivor Darreg puts out his **Annual Report**, recounting the events of the past year as they relate to his work in various musical fields. The 1985 edition has a lot to say about computers and synthesizers and their applications to microtonal music, potential uses for his megalyra family of instruments, the intransigence of the classical music establishment, the comings and goings of many people in the microtonal community near and far from his Southern California base, and countless other topics.

NOTICES

PROJECT PROPOSALS are now being sought for NEW MUSIC AMERICA 1987, to be held in Philadelphia, Oct. 2-11, 1987. For information write New Music America/Relache, P.O. Box 48039, Philadelphia, PA 19144. Proposal deadlines are 6/15/86 for installations, 7/30/86 for opera/music theater, 10/1/86 for all else.

The North American Conference on Micro-Intervalic Music, sponsored by the Interval Foundation of San Diego, will be taking place in Cuernavaca, Mexico, 7/12/86 to 7/19/86. There will be workshops, concerts, and some fascinating field trips, for the exploration of new scales and instruments. For more information write Interval Foundation, P.O. Box 8027, San Diego, CA 92102.

The 10th National Convention/Exhibition of the Guild of American Luthiers: A Festival of Handmade String Instruments and their Creators will be held at Pacific Lutheran University in Tacoma, Washington, from 7/31/86 to 8/3/86. There will be lectures, workshops and exhibits in what may be the largest gathering of string instrument makers and repairers ever. For more information, contact the Guild of American Luthiers, 8222 S. Park Ave., Tacoma, WA, 98408.

The Catgut Acoustical Society, devoted to research into violin acoustics, holds its 1986 International Symposium on Musical Acoustics at the University of Hartford, Hartford, CT, July 20-23, 1986. For more information, contact CAS at 112 Essex Ave., Montclair, NJ 07042.

(Continued on page 19)